

Economic viability assessment and economic value of Alaska LNG project - Phase 1

Final

November 19th, 2024



Agenda

Tuesday 19th November 2024

01	Introductions	5 minutes
02	Executive Summary	60 minutes
03	Questions	25 minutes

Project Background

Wood Mackenzie has worked extensively as an independent consultant on Alaska's energy issues since 2016 to provide an economic analysis of the viability of the cost of supply (CoS) for Alaska LNG (also referred to as AK LNG). Most recently in 2021/22, Alaska Gasline Development Corporation (AGDC) engaged Wood Mackenzie for an updated analysis that included calculating a new base CoS, identifying opportunities to optimize the CoS, a competitive analysis and providing our long-term projections.

Since the last study, AGDC has proposed a phased approach to developing Alaska LNG. Phase 1 involves developing the gas pipeline from the North Slope to Southcentral and Interior Alaska markets. As part of Phase 1, ADGC has engaged Wood Mackenzie for **an independent economic analysis of the proposed gas pipeline** and an **economic benefit analysis** for the state of Alaska.

The information on which this independent report is based has either come from our experience, knowledge and database or it has been supplied to us by AGDC. The opinions expressed in this report are those of Wood Mackenzie. They have been arrived at following careful consideration and enquiry, but we do not guarantee their fairness, completeness, or accuracy. The opinions, as of this date, are subject to change. Please note that for this engagement, we have adjusted our standard base case to reflect disclosed asset-specific information.

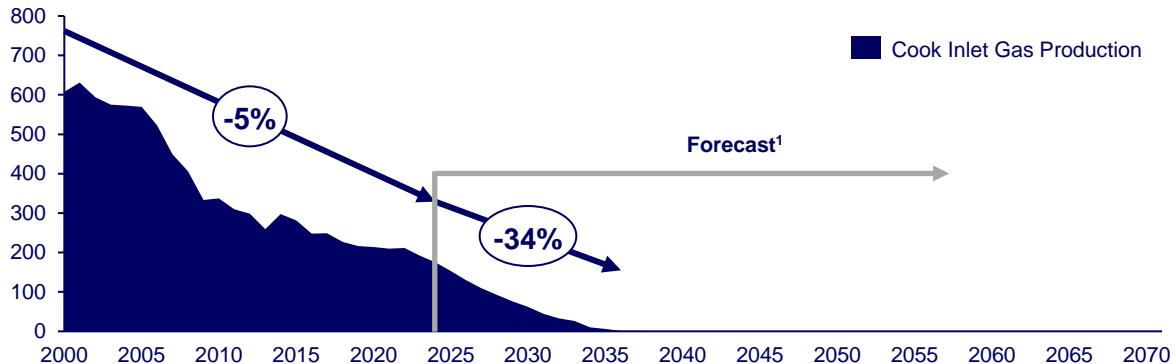
This Report is structured across 5 sections:

- Southcentral and Interior Alaska market overview
- Delivered cost of piped gas and scenario analysis
- Analysis of LNG imports as an alternative
- Economic impact of Alaska LNG Phase 1
- Final takeaways and conclusions

Gas supply has been dwindling, and despite exploration efforts by operators, no new volumes have been discovered in Cook Inlet to replenish the reserves

Cook Inlet gas production

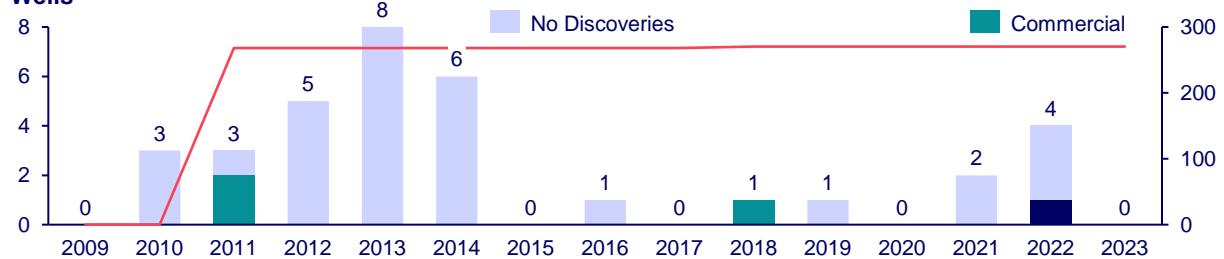
mmcfd



- Cook Inlet production is expected to be depleted by the mid-2030s
- Exploration success in the Cook inlet has been limited:
 - **34 exploration wells** drilled in the last 15 years
 - **9% success rate** with only three commercial discoveries
 - **270 bcf** of reserves discovered in the last 15 years

Exploration activity in the Cook Inlet basin

Wells



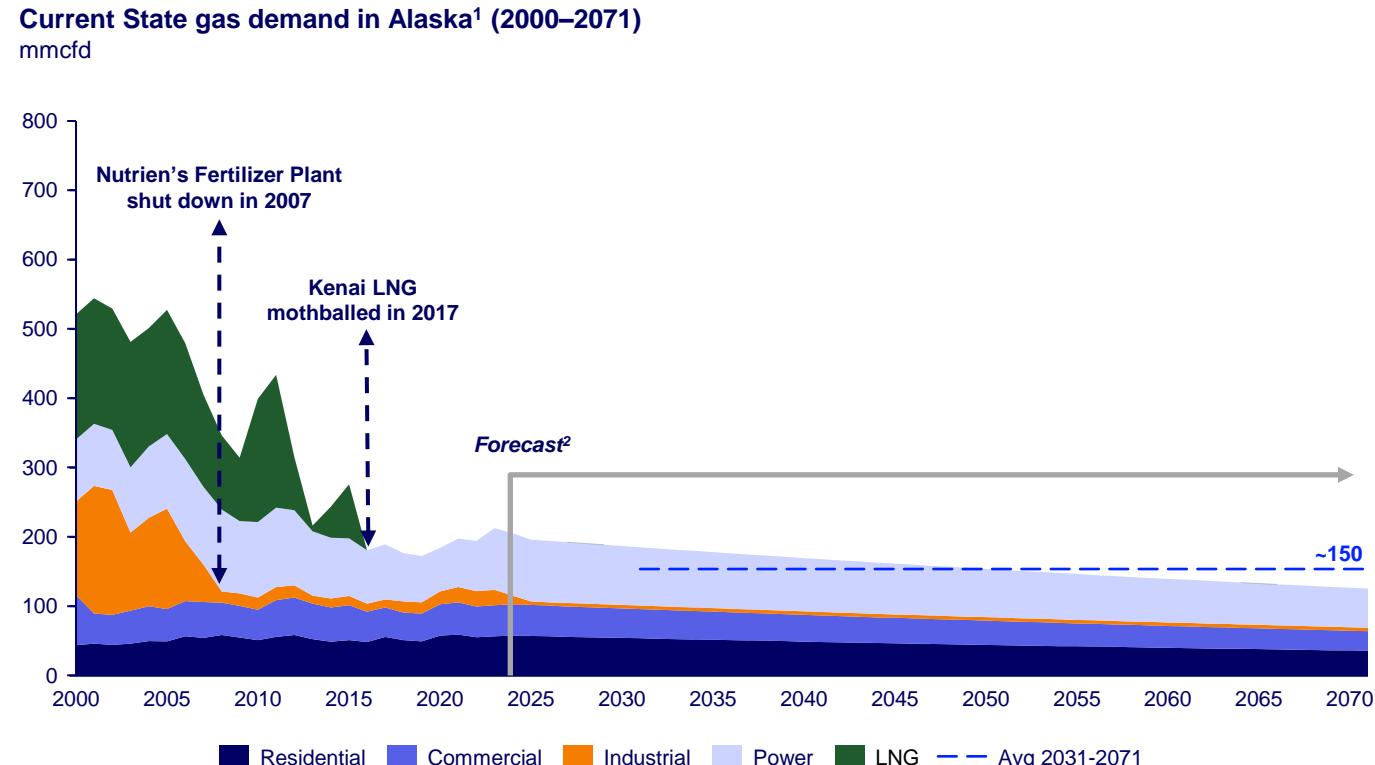
Source: Wood Mackenzie

1. Compounded Annual Decline Rate is 34% driven by production reaching 0 in 2037.

A lack of secure, consistent, and affordable supply of gas has driven a consistent decline (5% CAGR) in gas demand for the past 20 years

Based on Wood Mackenzie's (WM) current demand outlook for Alaska (adjusted for Industrial Sector reporting), we extended the forecast to 2071 to match the operating horizon for Alaska LNG Phase 1.

Due to supply constraints, industrial activity was impacted by the Nikiski Refinery lowering its demand to 5 mmcfd.

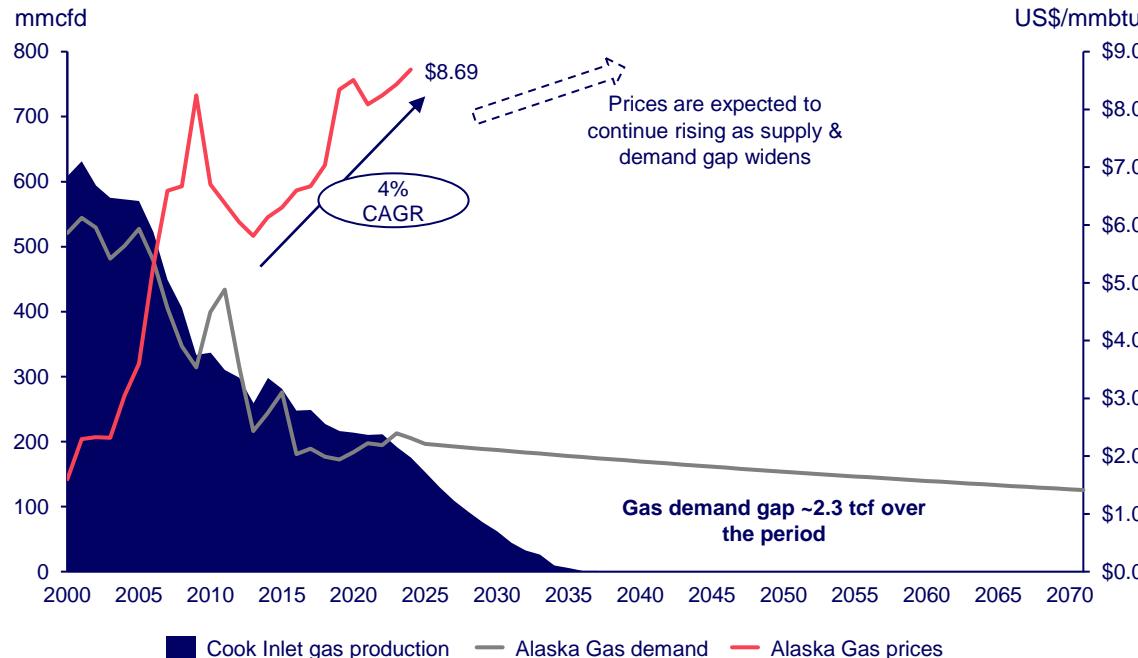


Source: Wood Mackenzie

1. Excludes North Slope Region In-field gas and considers the rest of regions with gas demand (Anchorage, Mat-Su, and Kenai Peninsula). Refer to Appendix for detailed assumptions. 2. Demand forecast shows WM outlook for 2024-2050, extended to 2071 and adjusted for Industrial reporting (2021-2023).

An estimated cumulative demand gap of ~2.3 tcf is projected which will likely continue to drive gas prices up for Alaska consumers

Cook Inlet gas production/demand¹ and gas prices in Alaska



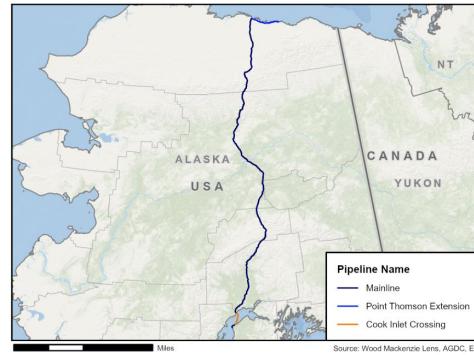
- Lack of steady gas supply and increasing gas prices have affected industrial development in the region
- Prices will continue to rise as the demand gap expands and reaches an average of 192 mmcfd between 2031 and 2071
- A total of **2.3 tcf** of gas is needed to fill the identified gap from 2031 to 2071, more than 8x the discovered reserves in the last 15 years
 - For this reason, relying on additional production from Cook Inlet is not considered a viable option to meet long-term demand

With Cook Inlet gas production recovery proving to be a challenge, two main alternatives to addressing the forecast supply gap are a new gas pipeline and LNG imports

Gas supply alternatives for Southcentral and Interior Alaska market

1. Natural gas supply via pipeline

In Phase 1, a 765-mile, 42-inch diameter mainline pipeline will connect the Southcentral Alaska region with the northern fields, providing a secure and affordable gas supply. In the beginning, the pipeline will supply local and industrial consumption, then expand to provide feed gas for export into LNG markets.

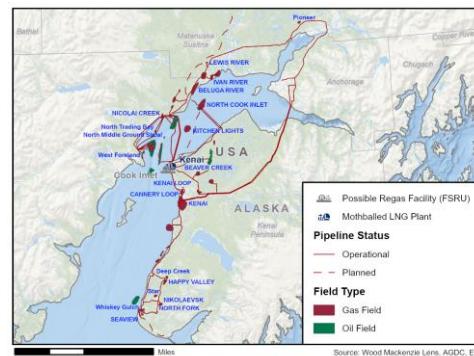


Key stats

- Total capex: From US\$10.8 billion to US\$14.9 billion for max capacity
- Time to first gas: 2031
- Capacity: 3.3 bcf/d at max
- Ability to expand to cover incremental investment in subsequent LNG phases

2. LNG imports¹

Gas imports via LNG require regas and further downstream infrastructure, including an FSRU dock to take the imported gas and potentially inland storage for operations optimization across yearly seasonality.



Key stats

- Total capex: TBD
- Time to first gas: 3 - 4 years post FID²
- Capacity: 400 to 450 mmcf/d fit for current demand without increased industrial activity
- Expected utilization: 40 – 45%

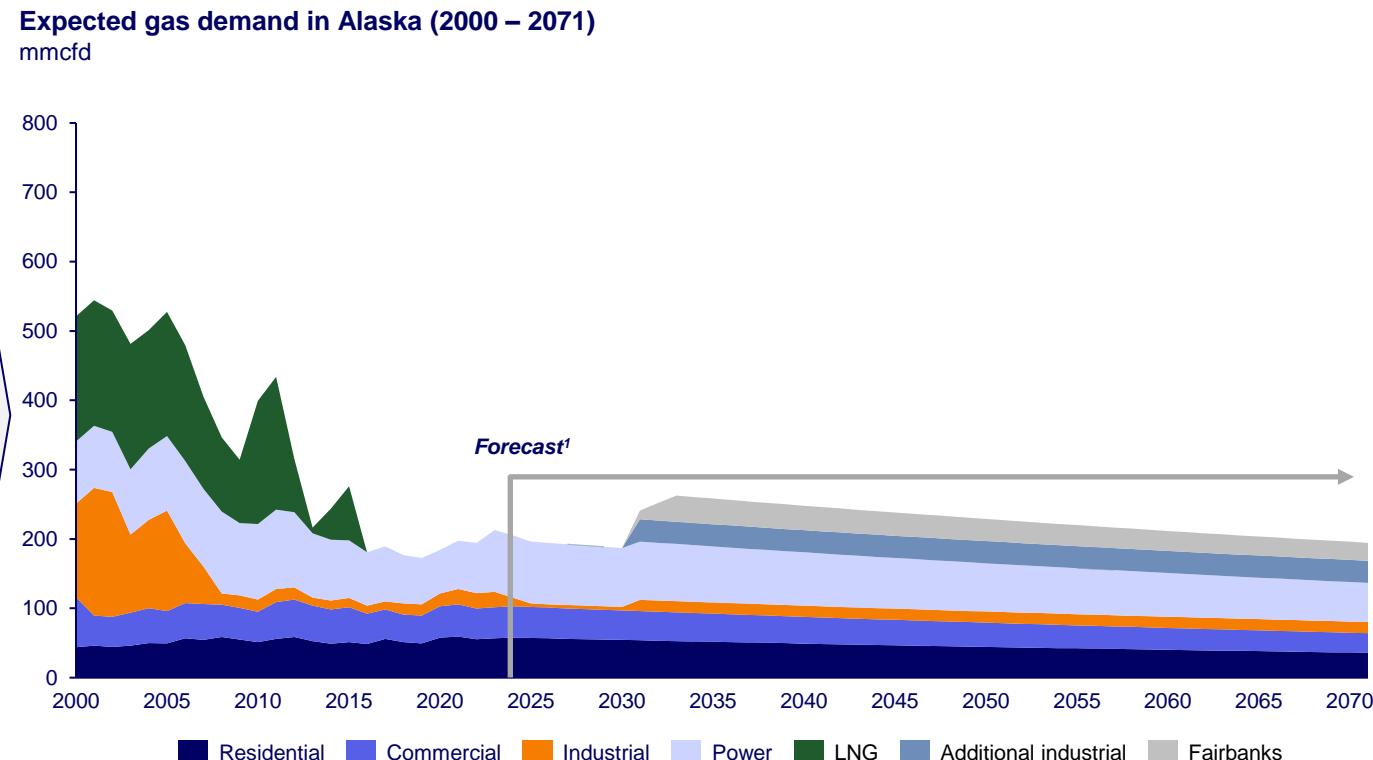
Source: AGDC, Wood Mackenzie

1. Map location of the FSRU is illustrative since planned location is pending definition based on receiving port; 2. Excelarate Energy announced in Aug '24 a target commercial start date for LNG imports via FSRU for 2028, suggesting its plans to take FID during 2024, though location of the required dock and overall status of the project is not clear as of writing of this report

If the Pipeline is built, additional demand will arise from 3 main sources: Fairbanks shifting to gas for energy/heat needs, Nikiski refinery demand recovering, and additional industrial applications

In addition to the Current State demand forecast, as shown in slide 5, the following are anticipated:

- Substitution of oil and wood as primary energy/heat source in Fairbanks¹.
- Industrial gas demand from the Nikiski Refinery shifts to burning propane. Gas demand reduces to 5 mmcfd, then rebounds to 16 mmcfd after the pipeline begins operations.
- New or returning industrial activity will produce an additional gas demand of 32 mmcfd with new gas supply availability².



Source: Wood Mackenzie

1. Fairbanks is a nonattainment area under the EPA. If Alaska LNG Pipeline is built, Fairbanks could change to gas for energy/heat needs. We assume 90% penetration with a 3-year transition (2031 – 2033)

2. In 2001, industrial demand reached 185 mmcfd with population at 632,716. Even though the population is expected to peak in 2033, WM expects enough demographic base to support increased demand back to historic levels via additional uses of natural gas, excluding the Fertilizer Plant (185 total – 137 Fertilizer – 16 Nikiski Refinery = 32).

Four scenarios were developed and analyzed to account for: existing gas demand (baseload), potential new demand brought by gas availability, and the construction of a 20 mtpa LNG facility

		Components	Average gas demand (mmcfd, 2031-2071)
Scenario 1: Baseload	This includes the Current State demand for gas in Southcentral and Interior Alaska. Plus, additional demand from Fairbanks substitution of oil/wood as gas becomes available to avoid EPA's nonattainment area designation and finally, the ramp-up from the Nikiski Refinery	Current state (Southcentral + Interior) + Fairbanks + Nikiski Refinery	~190
Scenario 2: WM Case	Baseload plus additional gas demand based on historical gas demand for the industrial sector and population growth forecasts. We estimate Industrial demand will reach 48 mmcfd (32 mmcfd additional to 16 mmcfd from the Nikiski Refinery ¹).	Baseload + Additional Industrial Activity	~220
Scenario 3: Additional Industrial demand	This considers the maximum upside from industrial demand based on high-consuming facilities starting operations. This incremental gas demand could come from restarting a previously operating fertilizer plant, a new ammonia plant (brownfield or greenfield) or new data centers.	WM Case + High-consuming industrial plant	~320
Scenario 4: Alaska LNG	The 20 mtpa LNG Facility (Alaska LNG) will require an additional 2,844 mmcfd at full capacity ² . This demand was added to the WM Case and assumed to come online in 2032 with one 6.7 mtpa train and two more in 2033 and 2034, respectively.	WM Case + Alaska LNG ³	~2,930

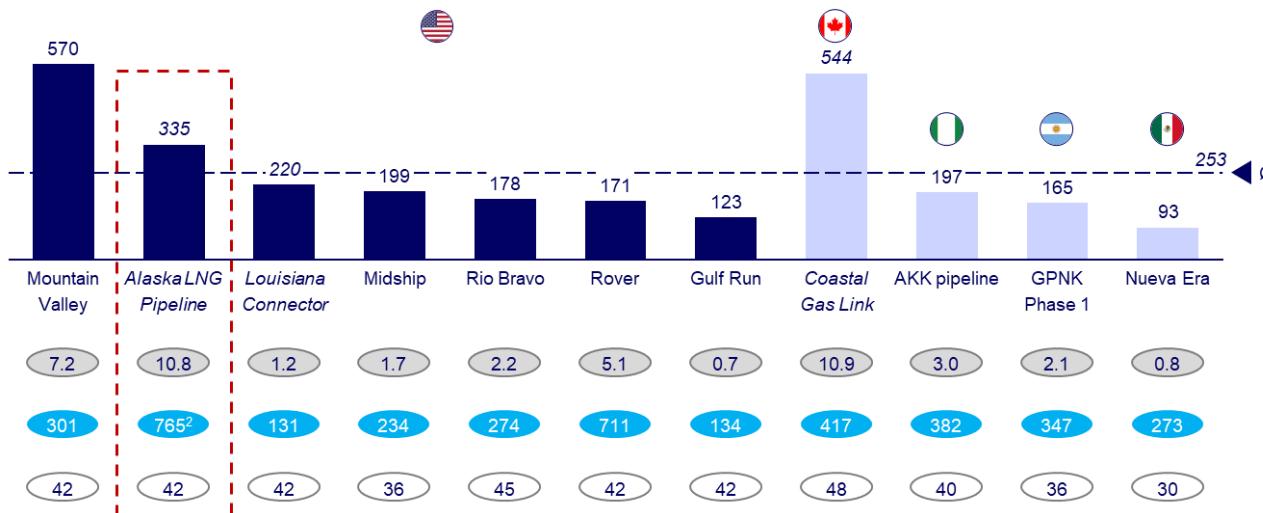
Source: Wood Mackenzie 1. In 2001 industrial demand reached 185 mmcfd with industrial activity and population at 632,716. Even though population is expected to peak in 2033, WM expects enough demographic base to support increased demand back to historic levels via additional uses of natural gas 2. Feedgas estimation considers 7.11% Liquefaction Loss, 1.56% Transport Loss, and 52,000,000 mmbtu/mt and 1,090 Btu/scf conversions. 3. Additional average demand is 2,705 for the 40 years due to phased kick-off of one train per year.

The total estimated cost of the pipeline is US\$10.8 billion for Phase 1, well within the range of recently built and proposed pipelines

Pipeline cost benchmark

k US\$/in-mi¹, real 2024

US
Non-US



*Italic labels refer to cost estimation
(pipeline not built and operating)*

- Mountain Valley and Coastal Gas Link have high costs largely due to specific regional context.
- Specific regions with regulatory challenges that have built new infrastructure, like the US NE and Canada BC, have seen longer timeframes and/or regulatory challenges delays.
- Additionally, economies of scale can be obtained for larger projects. Alaska LNG Phase 1 is two to five times bigger than peers
- However, this could lead to further contingency and/or cost overruns in the estimated cost of the Alaska LNG Phase 1 pipeline, on top of the 20% contingency currently considered

Costs in the first three scenarios account for minimum compression capacity but with Alaska LNG, the cost for compression and a segment to cross Cook Inlet is also considered

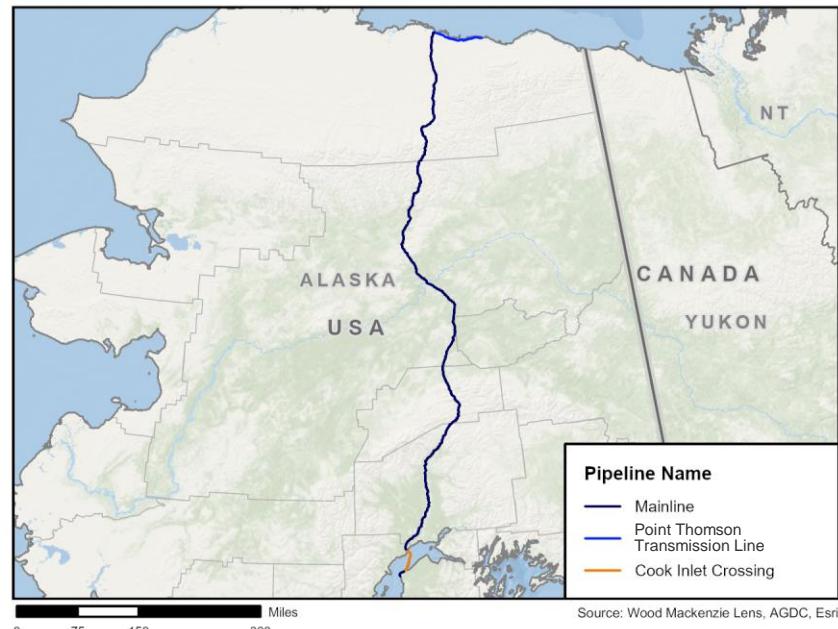
Alaska LNG Pipeline capex by scenario

Real 2024 US\$ million

Capex / Scenarios (2024 US\$ million)	Baseload	WM Case	Additional Industrial demand	Alaska LNG
Phase 1 mainline ¹	\$10,769	✓	✓	✓
Compression	\$2,485			✓
Cook Inlet + Additional Section	\$1,131			✓
Point Thompson Expansion	\$564			N.A. ²
Total Amount	\$14,950	\$10,769	\$10,769	\$10,769
				\$14,385

- In-state gas demand is burden only by Phase 1 Capex
- Additional cost is considered only for LNG volumes coming online

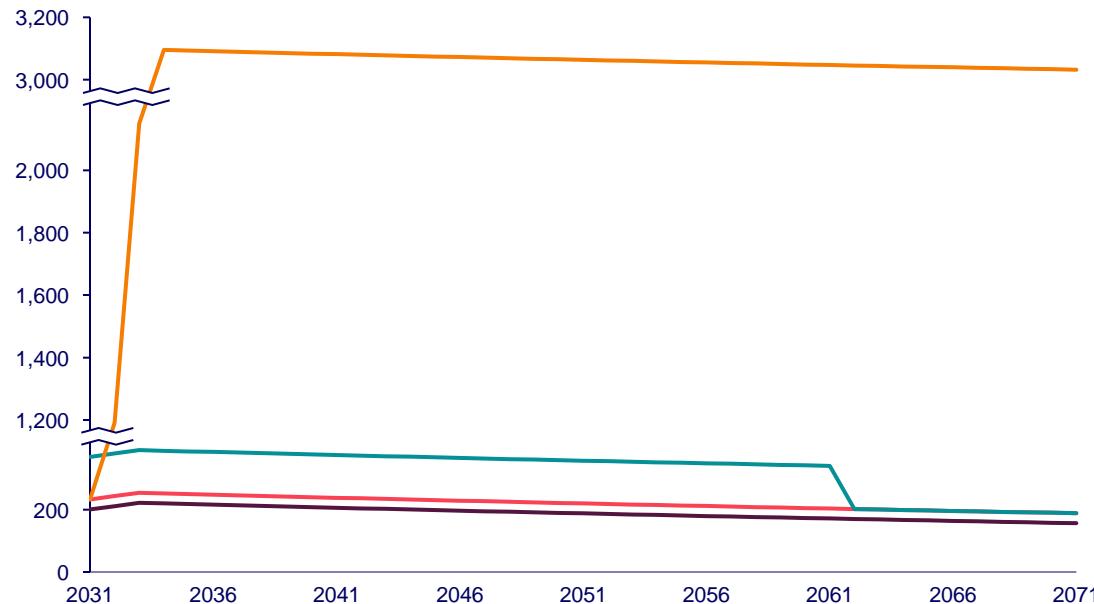
Alaska LNG Pipeline Scope



The scenario analysis shows an asymmetrical impact on the delivered cost of gas from a change in demand accruing to the consumers' benefit

Alaska LNG Pipeline Throughput Scenarios

mmcfd



Pipeline capex
2024 US\$ million

\$14,385

Additional compression capacity and Cook Inlet crossing

Additional Industrial

\$2.23

WM Case

\$8.97

Baseload

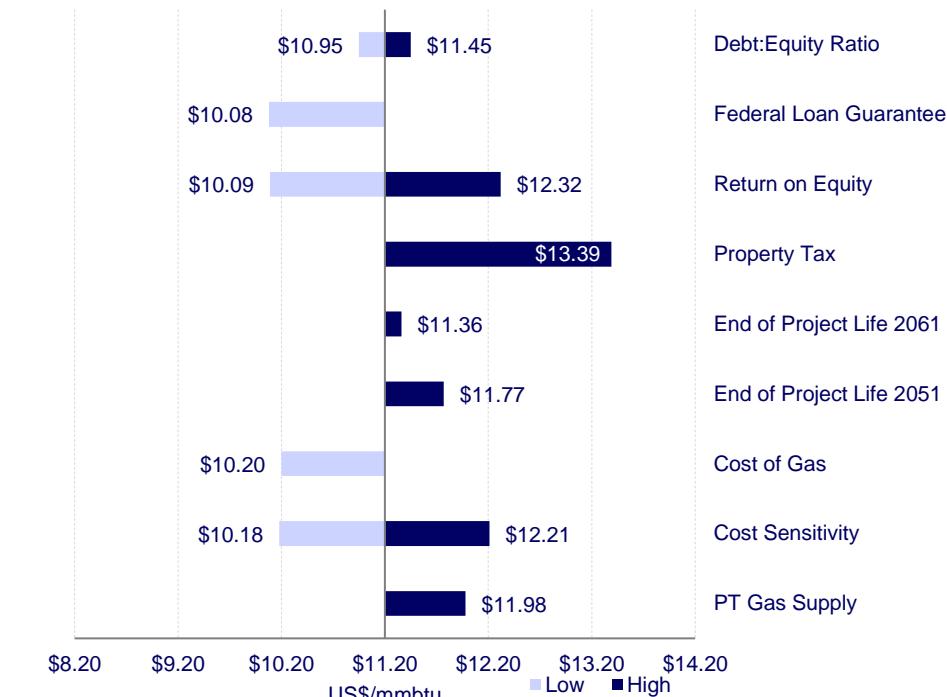
\$11.20

\$12.80

Additional sensitivities showed that securing a Federal Loan Guarantee and reducing Property Tax have the most impact on the cost of gas

Assumptions	Low	Base	High
Leverage – Debt : Equity Ratio	80:20	75:25	70:30
Federal Loan Guarantee	5.00%	6.25%	-
Return on Equity	7.5%	10.0%	12.5%
Property Tax	-	0.2%	2.0%
End of Project Life in 30 years	-	2071	2061
End of Project Life in 20 years	-	2071	2051
Cost of gas	\$0/mmbtu	\$1/mmbtu	
Capex Sensitivity	-10%	\$10.8 Bn	+10%
Alternative supply at Point Thomson: Increased Capex and Gas Price ¹	\$10.8 Bn & \$1/mmbtu	+564M & +US\$ 0.25/mmbtu	

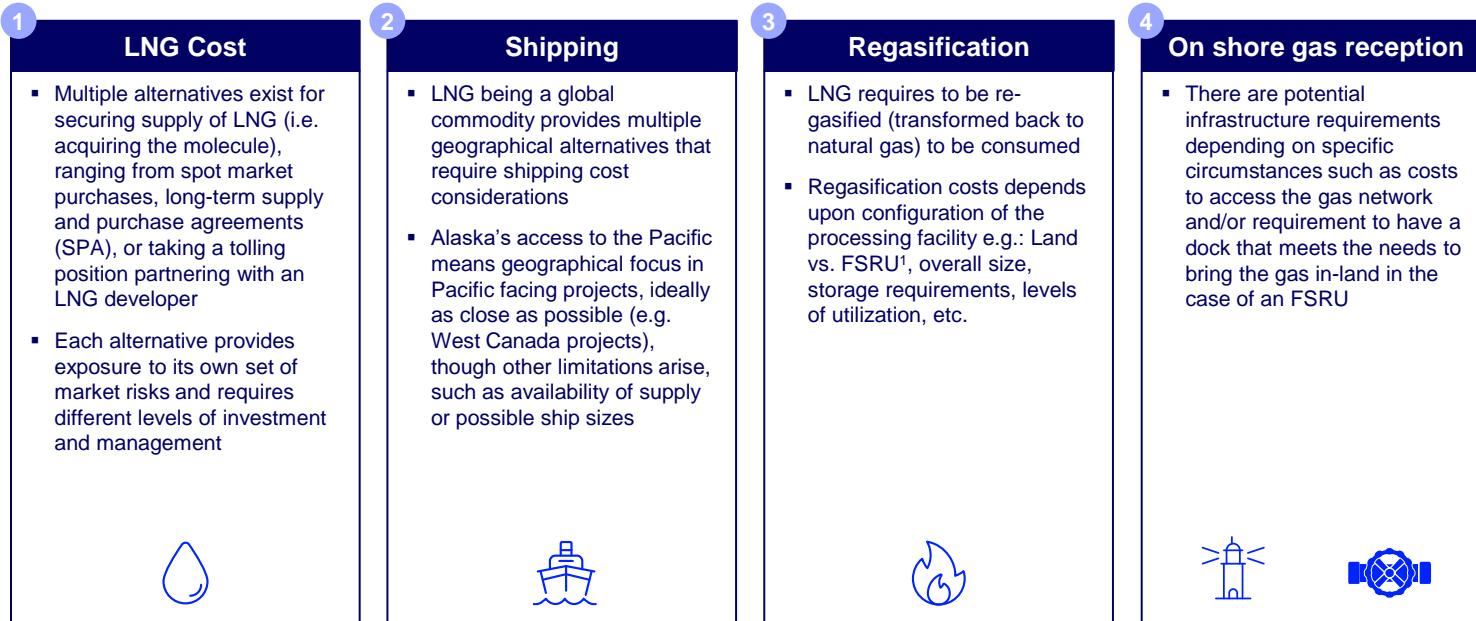
Delivered Cost of Gas – Sensitivity analysis on the WM Case Scenario Real 2024 US\$/mmbtu



Source: Wood Mackenzie; 1. The assumed gas price of US\$ 1.25/mmbtu was provided by AGDC and not verified by Wood Mackenzie

The LNG import cost analysis considers four main components (LNG cost, shipping, and regasification) across the value chain, each with a potential range of results

LNG import cost components



Range of
Cost
estimated for
LNG Imports

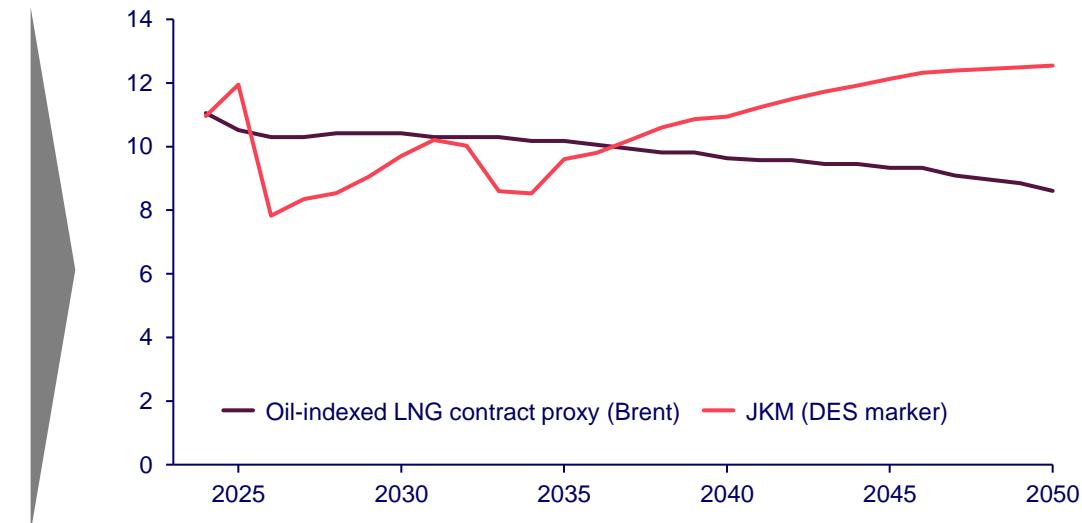
① Access to LNG in the Pacific will be linked to JKM or Oil-indexed long-term pricing; sellers are likely biased towards accepting JKM netback contracts

LNG Price – Considerations

- Oil linked prices are expected to trend lower as oil prices decline long term in real terms
- LNG supply and demand dynamics decouple with some seasonality in the short term and raise long term
- As JKM marker has matured, liquidity has risen, resulting in increased adoption for LNG deals
- LNG sellers are more likely to prefer **JKM** linked deals for **long term purchase (10 to 20yr range)** agreements, evidenced by the recent dominance of them, though the analysis will consider the two alternatives

LNG price outlook

US\$/mmbtu, real 2024

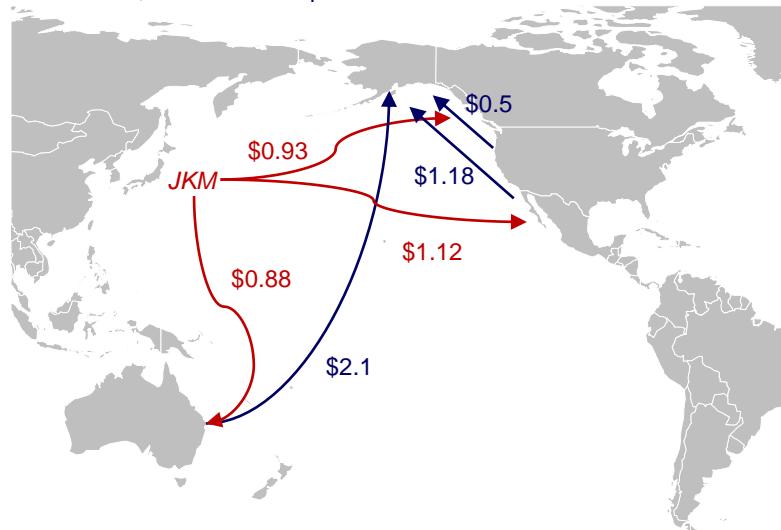


Delivered Price	Period Average	2031-2050 average
JKM (Des)	10.61	11.00
Oil linked (Brent)	9.86	9.64

② Shipping costs can impact delivered cost of LNG in the -0.4 to 1.2 /mmbtu range, depending on location of supply

Shipping routes and costs

US\$/mmbtu, cost of roundtrip



- The shipping adjustment should generally be positive to Alaska LNG imports due to access to the Pacific and proximity to potential LNG supply area in West Canada
- However, availability of supply in adequate form (e.g. ship size) can prove challenging for which alternative supply sources such as Australia have been considered

Net shipping adjustment (US\$/mmbtu)

Considers net back from JKM (subtracting cost from source to JKM) and adjustment to Alaska (adding cost from source to Alaska):

- Canada = $(0.93) + 0.5 = (0.43)$
- Australia = $(0.88) + 2.1 = 1.22$
- Mexico = $(1.12) + 1.18 = 0.06$

- At best JKM could be discounted considering $\sim(0.43)$ shipping adjustment. Though portfolio players would generally pocket premiums for any route optimization, giving buyers a full JKM price (without shipping adjustment) as alternative
- We consider the -0.43 to 1.22 as the shipping adjustment range

③ FSRUs generally show low levels of utilization (relative to onshore regas facilities) and regasification costs show correlation to overall size of facilities

FSRU Cost range

mmcfd, US\$/mmbtu, real 2024

Average Send Out Capacity (Nominal mmcfd)	Regas Cost (US\$/mmbtu)
520 +	0.4 – 0.75
500	~0.75
480	~0.80
410	~1.5
100	2.50

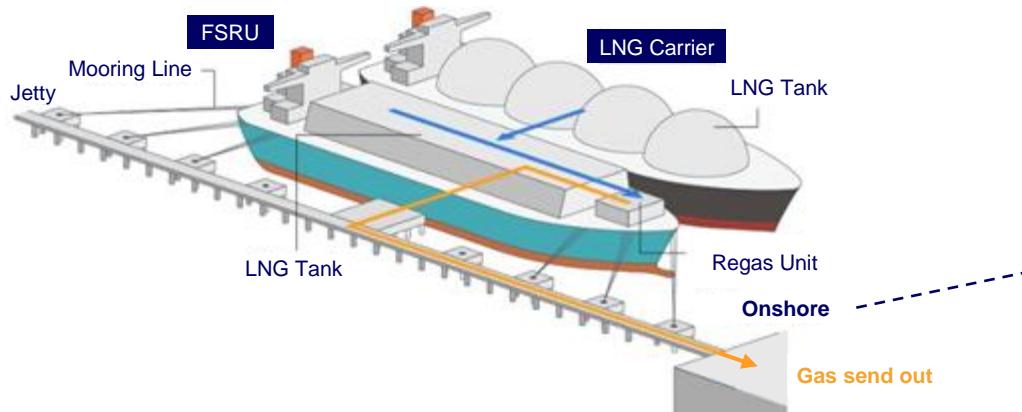


- Operating FSRUs generally show low utilization, ranging from 40 – 45%
- For a ~150 mmcfd estimated demand (South Central demand), nominal capacity would be expected in the 350 – 400 mmcfd range
- We estimate the regas cost would be in the **US\$ 1.0 – 1.5 / mmbtu**, though there would be incremental costs to build or adapt receiving infrastructure and further downstream requirements (e.g. site for docking, receiving gas network costs)
- There could also be optimization opportunities, including onshore storage operations to increase utilization, resulting in a lower sized nominal capacity requirement, though there is less availability of small scale FSRUs (i.e. under 200 mmcfd capacity)

④ **Onshore** reception site is largely dependent on infrastructure configuration, meta-oceanic conditions and specific buildup, requiring additional investment

Illustrative FSRU Onshore Connection

ILLUSTRATIVE



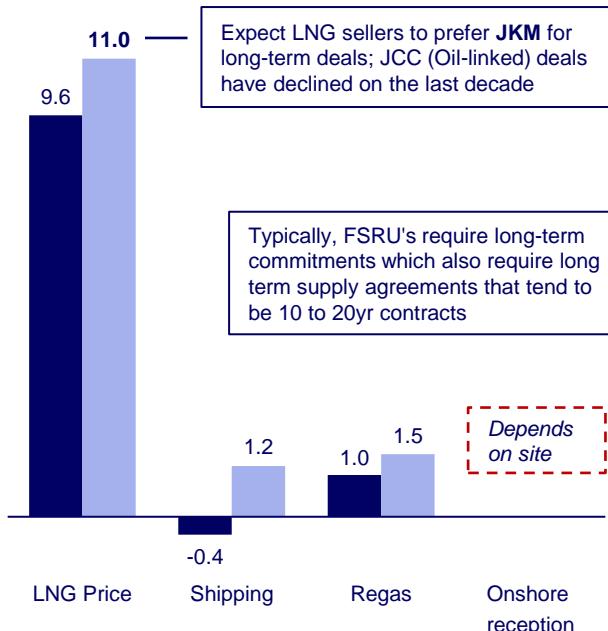
Onshore connection configuration can vary due to multiple factors resulting in additional investment requirements

Additional Capex could be in the US\$ 50 – 500 million range. However, as of now Wood Mackenzie is uncertain of a site and/or configuration to be used for the potential FSRU, thus costs and investment requirements are yet to be estimated

LNG imports estimated at ~US\$10.2-13.7/mmbtu plus onshore costs downstream of regas, within range of the delivered cost via pipeline

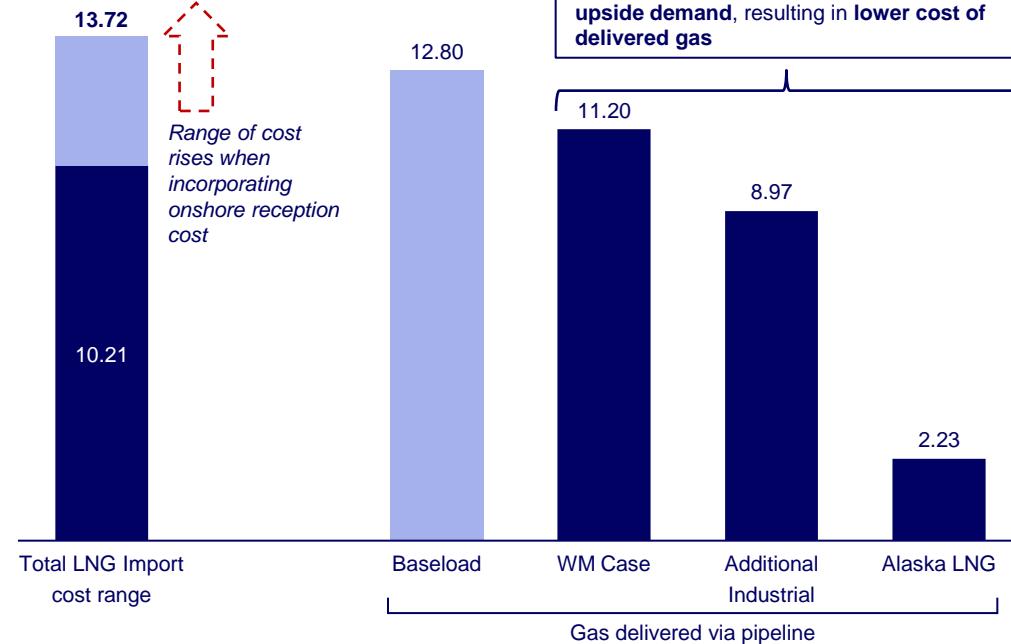
LNG Import cost range per value chain component¹

US\$/mmbtu, real 2024



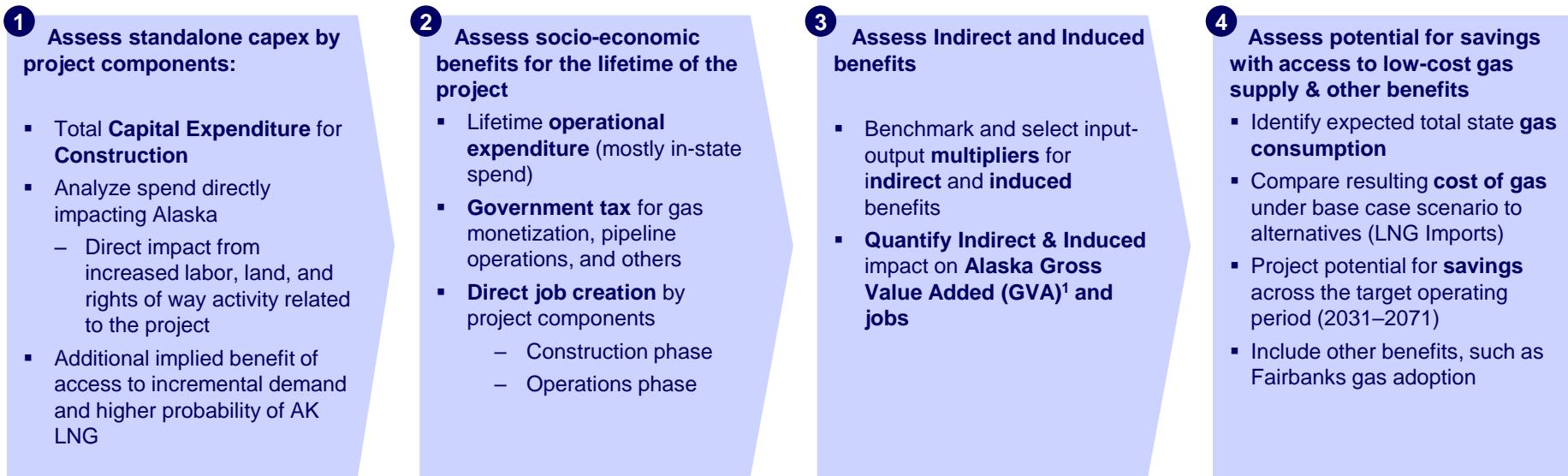
LNG Import cost (without onshore investment) vs Gas delivered via pipeline

US\$/mmbtu, real 2024



The approach to assess the socio-economics benefits of Alaska LNG Phase 1 considers four components

Components Considered to Assess Socio-Economic Benefits

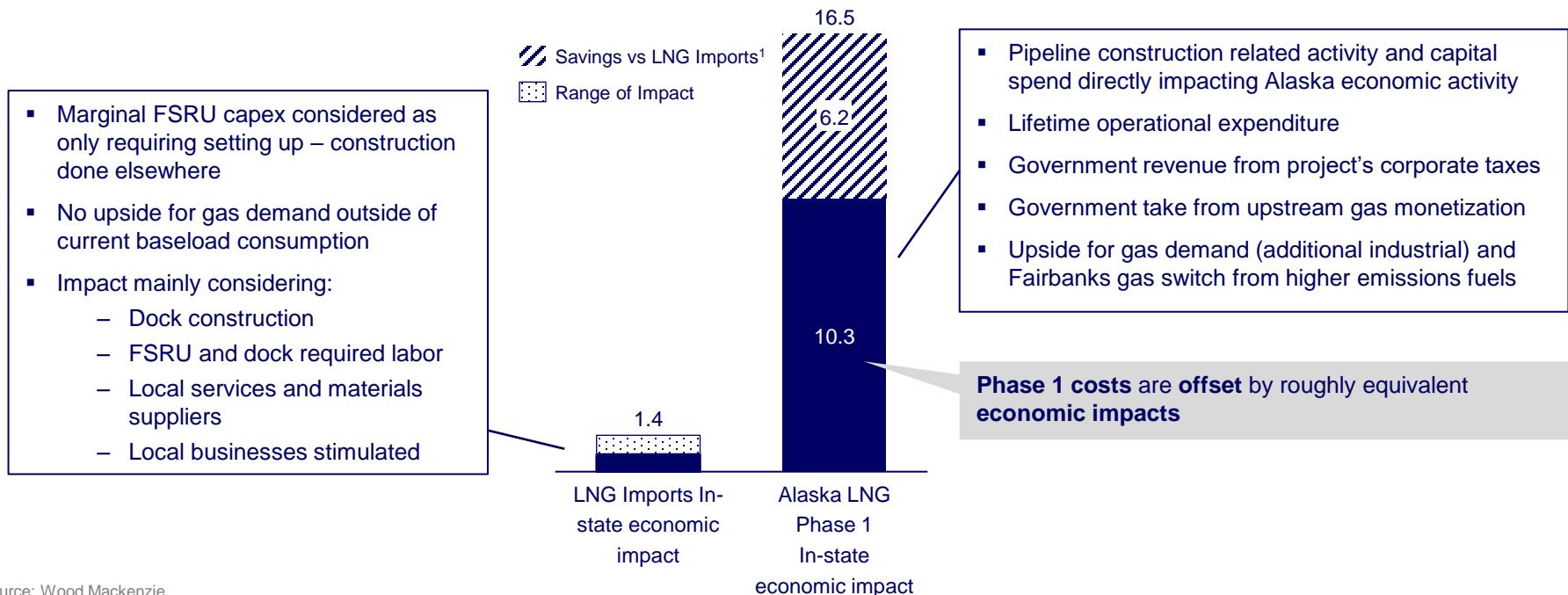


Alaska LNG Phase 1 development: Socio-economic benefits reflected in GVA, jobs and potential savings

Economic impact for Alaska LNG Phase 1 is 7x – 10x larger than the LNG imports alternative with the additional benefit of potential lower gas cost via industry expansion and upside demand

Economic Impact Comparison – LNG Imports vs Alaska LNG Phase 1

GVA in US\$ billion, 2024 Real



Source: Wood Mackenzie

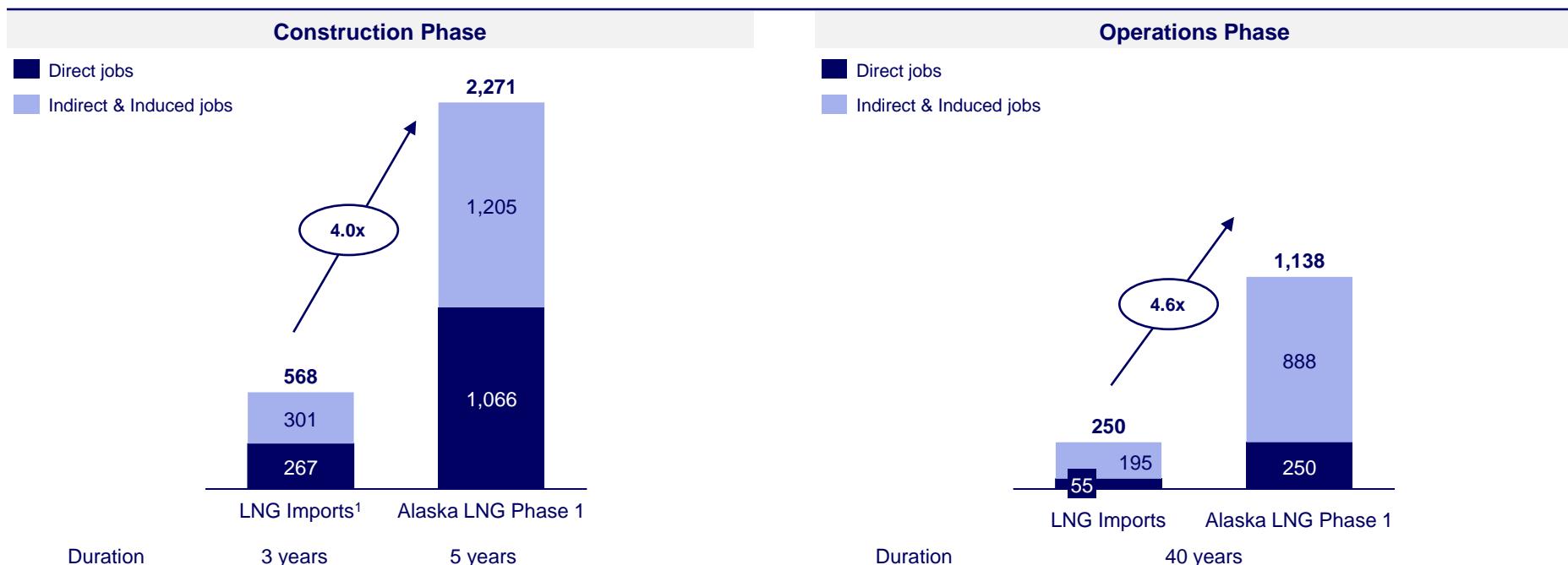
1. Savings reflect the total difference between sourcing 2.3 Tcf of total gas demand from 2031-2071 at \$11.20 USD/MMBtu with Alaska LNG Phase 1 vs. sourcing at \$13.72 USD/MMBtu from the LNG Imports alternative. 21

This also includes US\$ 500 from the indirect and induced effect of these savings.

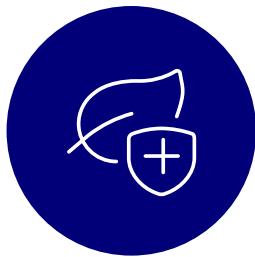
The impact in jobs created from Alaska LNG Phase 1 is 4x larger than the LNG imports alternative mainly due to a larger in-State construction scope

Economic Impact Comparison – LNG Imports vs Alaska LNG Phase 1

Average jobs per year - Direct, indirect, and induced



The substitution of wood/oil for gas in Fairbanks for its energy needs offers a range of benefits: cleaner air, lower emissions, removal from EPA's nonattainment designation, etc.



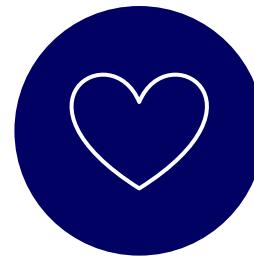
Cleaner air

- Local emissions from wood stoves and burning distillate oil contribute to particulate pollution
- With access to gas, a cleaner alternative becomes available to improve air quality



EPA's nonattainment designation

- A portion of the Fairbanks North Star Borough, including the City of Fairbanks, was designated as a PM^{2.5} Nonattainment Area in December 2009.
- By removing the designation, administrative expenses are reduced as the implementation plans to attain and maintain air pollutant emissions are no longer required.



Health

- Air pollution has direct consequences in public health
- By reducing air pollution, public health expenses may also decrease



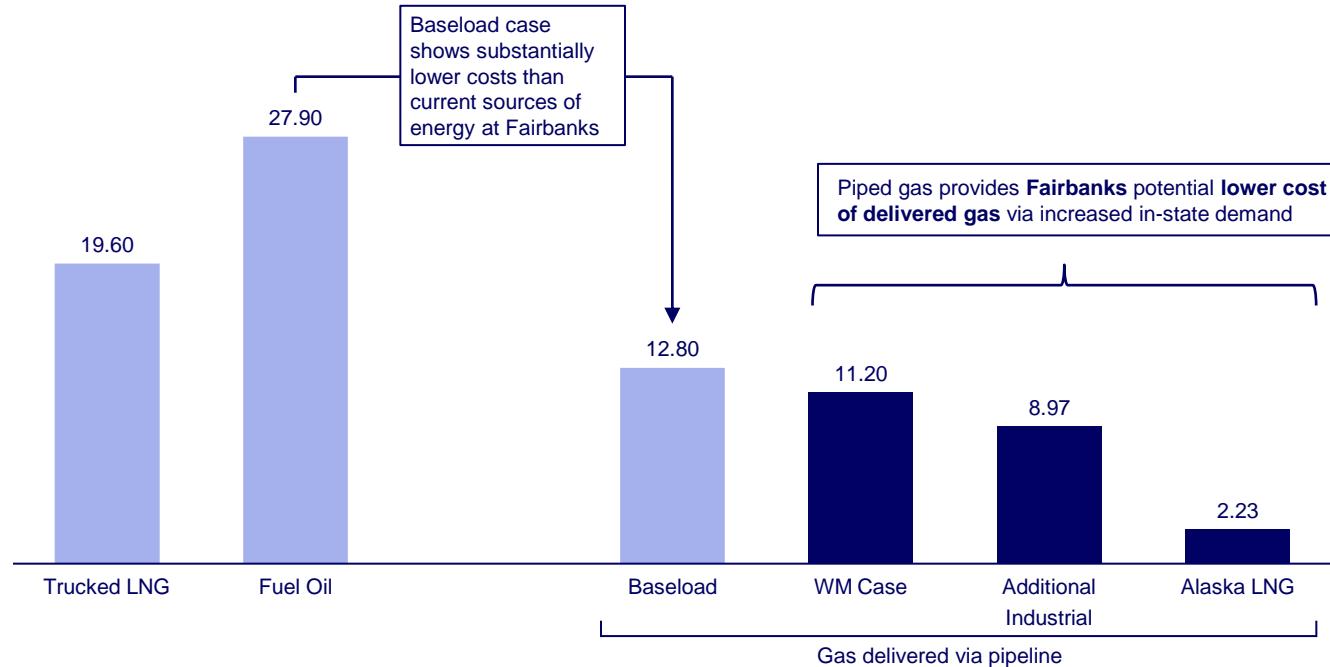
Potential access to grants and investment

- EPA's nonattainment designation may limit private and/or public investment in the region

Additionally, energy costs at Fairbanks could potentially drop when switching from fuel oil and trucked LNG to natural gas via pipeline

Fairbanks energy cost comparison – Trucked LNG and Fuel Oil vs Gas delivered via pipeline

US\$/mmbtu, real 2024



Gas supply via pipeline provides over ~US\$10 Bn of positive economic impact, 2 - 4x more jobs, and access to lower delivered costs vs LNG imports, though it requires higher capex

- **Cook Inlet gas supply has declined**, and despite exploration efforts by operators, **no new volumes** have been **discovered**
- Lack of reliable and affordable gas supply drove **decline in demand**, however going forward **supply** is expected to **drop faster** creating a **demand gap of ~2.3 tcf** (to 2071) projected to begin by the end of this decade
- With Cook Inlet gas production proving to be challenging, there are **two main alternatives** to address the forecasted **supply & demand gap**:

	 Natural Gas Supply via Pipeline	 LNG Imports
	A 765 mile (Phase 1), 42-inch diameter pipeline connecting the Southcentral Alaska region with the North Slope fields	Gas imports via LNG, for which regas and further downstream infrastructure is required
	<ul style="list-style-type: none"> ▪ Cost of delivered gas in the US\$2.23 – \$12.8/mmbtu 	<ul style="list-style-type: none"> ▪ Cost of delivered gas in the US\$10.2 – \$13.7/mmbtu (plus onshore costs)
	<ul style="list-style-type: none"> ▪ Direct, indirect and induced GVA: ~US\$ 10.3 Bn ▪ 2,271 jobs¹ created during construction and 1,138 in operations 	<ul style="list-style-type: none"> ▪ Lower capex & lower direct, indirect and induced GVA ~US\$0.6 – 1.4 Bn ▪ 568 jobs¹ during construction and 250 in operations
	<ul style="list-style-type: none"> ▪ Time to first gas 2031³ 	<ul style="list-style-type: none"> ▪ 3-4 Years post FID², though no major permit applications have been submitted. Permitting and/or required buildout could delay first gas
	<ul style="list-style-type: none"> ▪ Provides access to upside demand with additional industrial and economic benefits to the state ▪ Reducing emissions and removal from EPA's nonattainment in Fairbanks via substitution of oil & wood as primary energy source 	<ul style="list-style-type: none"> ▪ Focused supply for the Southcentral region ▪ No Fairbanks or additional industrial demand ▪ Exposure to higher price volatility for energy needs
	<ul style="list-style-type: none"> ▪ Higher likelihood of full Alaska LNG Project 	

Source: Wood Mackenzie; 1. Direct, indirect and induced jobs, average per year of each period; 2. First gas for LNG imports is dependent on receiving all required permits, and Wood Mackenzie is uncertain about the status of those. Additionally, as of March 2024, Enstar's (local gas distributor) earliest estimation of first gas is 2029. 3. The AGDC has indicated that the pipeline has all major permits in place

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